

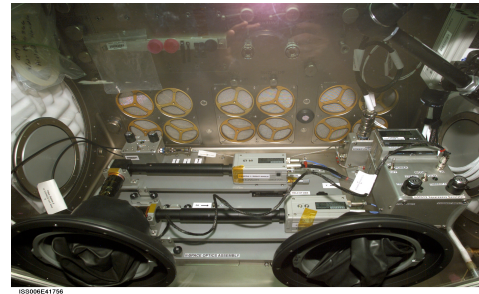


# Investigating the Structures of Paramagnetic Aggregates from Colloidal Emulsions-2, -3 (InSPACE-2, -3)



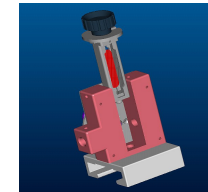
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InSPACE in MSG

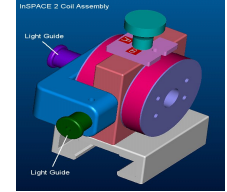


Glenn Research Center

Knob for Crew Handling



Vial Assembly



Coil Assembly

## Objective:

- Visually study the gelation transition in magneto-rheological (MR) fluids under steady and pulsed magnetic fields.
- InSPACE-2 continued the InSPACE-1 studies to determine the lowest energy configurations of the three dimensional structures of a MR fluid in a pulsed magnetic field.
- InSPACE-3 will study the effect of particle shape on the kinetics of aggregation and structures formed by pulsed magnetic fields in suspensions of superparamagnetic particles.

## Relevance/Impact:

- MR fluids are a class of smart materials capable of changing visco-elastic properties. Microgravity data of the internal particle structure and dynamics will provide an assessment of the viscous-elastic properties of these fluids. The results may improve limb and dextrous motion in robotic components and human-robotic interfaces for EVA suits.

## Development Approach:

- Using the hardware from InSPACE-1 already on ISS, InSPACE-2 will visually study new samples to meet the above objectives. An improved cell design will be used for imaging of the resulting aggregate structures. The new cells are dimensionally very thin in one direction reducing the optical thickness, hence providing enhanced viewing. A new coil is also provided that allows the substitution of multiple samples in two orthogonal orientations for alternate views.
- InSPACE-2 hardware consists of 1 primary Coil Assembly and 1 backup Coil Assembly, 4 vial assemblies and 4 backups.
- InSPACE-3 hardware will consist of 3 modified vial assemblies, 3 backup vial assemblies utilizing 3 different MR fluids.

## ISS Resource Requirements

Accommodation (carrier)	Microgravity Science Glovebox
<b>Upmass (kg)</b> (w/o packing factor)	3.57 (InSPACE-2) TBD (InSPACE-3)
<b>Volume (m<sup>3</sup>)</b> (w/o packing factor)	0.011 (InSPACE-2) TBD (InSPACE-3)
<b>Power (kw)</b> (peak)	0.030
<b>Crew Time (hrs)</b> (installation/operations)	14 (~2.5hr./sample)
<b>Launch/Increment</b>	10A/20A - Middeck w/L-48hrs. late stowage

## Project Life Cycle Schedule

Milestones	SCR	RDR	CDR	Safety	Bench Review	PSR/SAR	FHA	Launch	Ops	Return	Final Report
InSPACE-2				3/14/2007	9/12/2007	8/24/2007	10/11/2007	10/13/2007	Inc.17/18/19	2008	2009
InSPACE-3			1/09	5/10	7/10	6/10	6/10	7/10	Inc 22-24	TBD	TBD
<b>Documentation</b>  Revision Date: 2/2010	Website: <a href="http://spaceflightsystems.grc.nasa.gov/Advanced/ISSResearch/MSG/InSPACE/">http://spaceflightsystems.grc.nasa.gov/Advanced/ISSResearch/MSG/InSPACE/</a> eRoom: In-SPACE				SRD: completed EDMP: preflight for In-SPACE-2			Project Plan: draft in eroom SEMP: ??			